

Appl. No. 09/917,099
Amdt. Dated October 12, 2006
Reply to Office Action of April 19, 2006

Attorney Docket No. 81784.0240
Customer No.: 26021

Listing of Claims:

1. (Withdrawn): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at an outer peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the outer peripheral region of the display area between said pair of substrates to form a display panel body;

disposing a thermally conductive buffer plate comprising a heat-shrinkable material which is preheated at one or more outer surfaces of said pair of substrates of said display panel body, aligned such that an opening formed in said buffer plate overlaps the display area of said display panel body; and

heating and curing said thermosetting seal material while applying a pressure from said outer surface of said display panel body to between said substrates through said buffer plate.

2. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 1, wherein

said display panel body includes a plurality of panel regions to be formed into liquid crystal display panels, said thermosetting seal material is disposed in an outer peripheral region of an area to be formed into a display area of each of the panel regions, and

said buffer plate includes an opening formed at a position corresponding to said area of each of said panel regions.

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3. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 1, wherein

at the region of said display panel body where said seal material is disposed, said seal material is heated and cured while a pressure is applied thereto by a pair of heating plates disposed sandwiching said buffer plate disposed at each outer surface of said pair of substrates.

4. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 3, wherein

a dummy substrate is disposed between at least a lower plate of said pair of heating plates and said buffer plate disposed under said display panel body, and

at least a lower buffer plate, said display panel body, and an upper buffer plate are stacked on said dummy substrate in this order from the bottom in an aligned manner, and are introduced together with said dummy substrate to a space between said pair of heating plates.

5. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 3, wherein

said display panel body includes a plurality of panel regions to be formed into liquid crystal display panels, and said thermosetting seal material is disposed in each of the panel regions in an outer peripheral region of an area to be formed into a display area, and

said buffer plate includes an opening formed at a position corresponding to said area of each of said panel regions.

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6. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 3, wherein

no spacers for defining the gap between the substrates in said display area are provided in said display panel body.

7. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 1, wherein

no spacers for defining the gap between the substrates in said display area are provided in said display panel body, and

at the region of said display panel body where said seal material is disposed, said seal material is heated and cured while a pressure is applied thereto by a pair of heating plates disposed sandwiching at least said buffer plate disposed at said one or more outer surfaces of said pair of substrates.

8. (Withdrawn): A buffer plate for applying a pressure to a display panel body in which a thermosetting seal material is disposed in an outer peripheral region of a display area between a pair of substrates, and conducting heat to said thermosetting seal material to cure the seal material, wherein

an opening is formed at a position overlapping an area to be formed into the display area of said display panel body; and

said buffer plate further comprises a rigid film having a high rigidity and buffer films provided to sandwich said rigid film and having a lower rigidity than the rigidity of said rigid film.

9. (Withdrawn): The buffer plate according to claim 8, wherein
said display panel body includes a plurality of panel regions to be formed into display panels, and said thermosetting seal material is disposed in each

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of the panel regions in the outer peripheral region of an area to be formed into a display area, and

an opening is formed at a position overlapping said area to be formed into a display area of each of said panel regions.

10. (Withdrawn): The buffer plate according to claim 8, wherein
no spacers for defining a gap between the substrates in said display area are provided in said display panel body.

11. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 1, wherein
the preheating of said buffer plate is performed under conditions substantially identical to the conditions during the heating and curing process applied to said thermosetting seal material.

12. (Withdrawn): The method of manufacturing a liquid crystal display panel according to claim 1, wherein
no spacers for defining the gap between the substrates in said display area are provided in said display panel body.

13. (Withdrawn): The buffer plate according to claim 8, wherein said rigid film is formed of a metal.

14. (Withdrawn): The buffer plate according to claim 8, wherein
said rigid film is formed of a metal; and
said buffer film is formed of polytetrafluoroethylene.

15. (Withdrawn): The buffer plate according to claim 8, wherein said buffer film is formed of polytetrafluoroethylene.

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16. (Previously Presented): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at a peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the peripheral region of the display area between said pair of substrates, said thermosetting seal material and said pair of substrates forming a display panel body;

disposing a thermally conductive buffer plate at each of two sides of outer surfaces of said pair of substrates of said display panel body, aligned such that an opening formed in said buffer plates each provided on said two sides of said outer surfaces of said pair of substrates overlaps the display area of said display panel body, said buffer plate being a layered structure which includes a rigid film having a high rigidity and buffer films provided to sandwich said rigid film therebetween and having a lower rigidity than the rigidity of said rigid film; and

heating and curing said thermosetting seal material while selectively applying a pressure from said outer surface of said display panel body to the region where the thermosetting seal material is disposed through said buffer plates, without pressing the display regions of the display panel body which overlap the openings formed in the buffer plates, in the portions of the buffer plates corresponding to the openings.

17. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein said step of disposing a thermally conductive buffer plate includes the step of forming said buffer plate using a rigid film which is made of metal.

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18. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein said step of disposing a thermally conductive buffer plate includes the step of forming said buffer plate using a rigid film which is made of metal and buffer films which are made of polytetrafluoroethylene.

19. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein said step of disposing a thermally conductive buffer plate includes the step of forming said buffer plate using buffer films which are made of polytetrafluoroethylene.

20. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein

at the region of said display panel body where said seal material is disposed, said seal material is heated and cured while a pressure is applied thereto by a pair of heating plates disposed sandwiching said buffer plate disposed at each outer surface of said pair of substrates.

21. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, comprising the further steps of:

disposing a dummy substrate between at least a lower plate of a pair of heating plates and said buffer plate disposed under said display panel body, and

stacking a lower buffer plate, said display panel body, and an upper buffer plate on said dummy substrate in this order from the bottom in an aligned manner, and introducing said lower buffer plate, said display panel body and said upper buffer plate together with said dummy substrate to a space between said pair of heating plates.

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22. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, comprising the further steps of:

forming said display panel body with a plurality of panel regions formed into liquid crystal display panels, and disposing said thermosetting seal material in each of the panel regions in a peripheral region of an area to be formed into a display area, and

forming an opening in said buffer plate at a position corresponding to said area of each of said panel regions.

23. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein

the gap between the substrates in said display area is defined without providing spacers in said display panel body.

24. (Withdrawn): A method for manufacturing a liquid crystal display panel according to claim 1, wherein

said preheating of said buffer plate is executed at the same temperature as said heating and curing process of said thermosetting seal material.

25. (Withdrawn): A method for manufacturing a liquid crystal display panel according to claim 1, wherein

said preheating of said buffer plate is executed after an opening is formed on said buffer plate.

26. (Withdrawn): A method for manufacturing a liquid crystal display panel according to claim 1, wherein

said preheating of said buffer plate is executed before an opening is formed on said buffer plate.

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27. (Withdrawn): A method for manufacturing a liquid crystal display panel according to claim 1, wherein

said heating and curing process of said thermosetting seal material is executed at 150 °C.

28. (Withdrawn): A method for manufacturing a liquid crystal display panel according to claim 1, wherein

said buffer plate is preheated after an opening is formed on said buffer plate, and said preheating is executed at a temperature of 150 °C. which is identical to that for said heating and curing process of said thermosetting seal material.

29. (Withdrawn): A buffer plate according to claim 8, wherein

said thermosetting seal material has a curing temperature of 150 °C.

30. (Withdrawn): A buffer plate according to claim 8, wherein

said buffer film having a lower rigidity than the rigidity of said rigid film comprises a heat-shrinkable material and is preheated.

31. (Withdrawn): A buffer plate according to claim 30, wherein

said buffer film having a lower rigidity than the rigidity of said rigid film is preheated at a temperature which is identical to the curing temperature of said thermosetting seal material.

32. (Withdrawn): A buffer plate according to claim 8, wherein

said buffer film having a lower rigidity than the rigidity of said rigid film comprises a heat-shrinkable material and is preheated at a 150° C. which is identical to the curing temperature of said thermosetting seal material.

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33. (Previously Presented): A method of manufacturing a liquid crystal display panel according to claim 16, wherein

said pair of substrates are affixed to each other with said predetermined gap without a spacer.

34. (Previously Presented): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at an outer peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the outer peripheral region of the display area between said pair of substrates to form a display panel body having a plurality of panel regions which form liquid crystal display panels in later steps;

disposing a thermally conductive buffer plate at each of two sides of outer surfaces of said pair of substrates of said display panel body, aligned such that each of a plurality of openings formed in said buffer plate overlaps each of said plurality of panel regions of said display panel body; and

heating and curing said thermosetting seal material while selectively applying a pressure from said outer surface of said display panel body to the region where the thermosetting seal material is disposed through said buffer plates, without pressing the display region of the display panel body which overlap the openings formed in the buffer plates, in the portions of the buffer plates corresponding to the openings.

35. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 34, wherein

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at the region of said display panel body where said sealed material is disposed, said sealed material is heated and cured while a pressure is applied thereto by a pair of heating plates disposed sandwiching of said buffer plate disposed at each outer surface of said pair of substrate.

36. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 35, comprising the further steps of:

disposing a dummy substrate between at least a lower plate of a pair of heating plates and said buffer plate disposed under said display panel body; and

stacking a lower buffer plate, said display panel body, an upper buffer plate on said dummy substrate in this order from the bottom in an aligned manner, and introducing said lower buffer plate, said display panel body and said upper buffer plate together with said dummy substrate to a space between said pair of heating plates.

37. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 34, wherein

said pair of substrates are affixed to each other with said predetermined gap without a spacer.

38. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 16, wherein

a plurality of pairs of substrates are layered with each buffer plate being sandwiched between adjoining pairs of substrates and the buffer plates are disposed on two sides of the outer surfaces of each of all the plurality of pairs of substrates.

39. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 34, wherein.

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a plurality of pairs of substrates are layered with each buffer plate being sandwiched between adjoining pairs of substrates and the buffer plates are disposed on two sides of the outer surfaces of each of all the plurality of pairs of substrates.

40. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 21, wherein

the dummy substrate is provided between a lower plate of a pair of heating plates and the lowermost buffer plate and between an upper plate of the pair of heating plates and the uppermost buffer plate.

41. (Previously Presented): The method of manufacturing a liquid crystal display panel according to claim 36, wherein

the dummy substrate is provided between a lower plate of a pair of heating plates and the lowermost buffer plate and between an upper plate of the pair of heating plates and the uppermost buffer plate.

42. (Previously Presented): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at a peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the peripheral region of the display area between said pair of substrates, said thermosetting seal material and said pair of substrates forming a display panel body;

disposing a thermally conductive buffer plate at each of two sides of outer surfaces of said pair of substrates of said display panel body, aligned such that an opening formed in said buffer plates each provided on said two sides of said

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outer surfaces of said pair of substrates overlaps the display area of said display panel body, said buffer plate being a layered structure which includes a rigid film having a high rigidity and buffer films provided to sandwich said rigid film therebetween and having a lower rigidity than the rigidity of said rigid film; and

heating and curing said thermosetting seal material while selectively applying a pressure from said outer surface of said display panel body to the region where the thermosetting seal material is disposed through said buffer plates, without pressing the display regions of the display panel body which overlap the openings formed in the buffer plates, in the portions of the buffer plates corresponding to the openings;

the buffer plates being thermally conductive buffer plates which include a heat-shrinkable material and are preheated.

43. (Previously Presented): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at an outer peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the outer peripheral region of the display area between said pair of substrates to form a display panel body having a plurality of panel regions which form liquid crystal display panels in later steps;

disposing a thermally conductive buffer plate at each of two sides of outer surfaces of said pair of substrates of said display panel body, aligned such that each of a plurality of openings formed in said buffer plate overlaps each of said plurality of panel regions of said display panel body; and

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heating and curing said thermosetting seal material while selectively applying a pressure from said outer surface of said display panel body to the region where the thermosetting seal material is disposed through said buffer plates, without pressing the display region of the display panel body which overlap the openings formed in the buffer plates, in the portions of the buffer plates corresponding to the openings;

the buffer plates being thermally conductive buffer plates which include a heat-shrinkable material and are preheated.

44. (Previously Presented): A method of manufacturing a liquid crystal display panel in which a pair of substrates are affixed to each other at an outer peripheral region of a display area thereof with a predetermined gap therebetween and liquid crystal is sealed in a cell space formed between the opposing substrates in a region corresponding to said display area, comprising the steps of:

disposing a thermosetting seal material in the outer peripheral region of the display area between said pair of substrates to form a display panel body;

disposing a thermally conductive buffer plate at each of two sides of outer surfaces of said pair of substrates of said display panel body; and

heating and curing said thermosetting seal material while selectively applying a pressure from said outer surface of said display panel body to the region where the thermosetting seal material is disposed through said buffer plates.